16-30CRW2-2

DIST. M

CO AN 08-30CRW2-2

CLASSIFICATION CANCELED
Auth: T.O. 00-4 1 May 46
By /S/ J.O. Buchanan, Maj. AC
Date 31 May 46

HANDBOOK OF MAINTENANCE INSTRUCTIONS

for

RADIO RECEIVING SET AN/CRW-2

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Approved 25 NOVEMBER 1944

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Destruction of Abandoned Materiel in the Combat Zone

In case it should become necessary to prevent the capture of this equipment and when ordered to do so, DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

Means:-

1. Explosives, when provided.
2. Hammers, axes, sledges, machetes, or whatever heavy object is readily available.
3. Burning by means of incendiaries such as gasoline, oil, paper, or wood.
4. Grenades and shots from available arms.
5. Burying all debris or disposing of it in streams or other bodies of water, where possible and when time permits.

Procedure:-

1. Obliterate all identifying marks. Destroy nameplates and circuit labels.
2. Demolish all panels, castings, switch- and instrument-boards.
3. Destroy all controls, switches, relays, connections, and meters.
4. Rip out all wiring and cut interconnections of electrical equipment. Smash gas, oil and water-cooling systems in gas-engine generators, etc.
5. Smash every electrical or mechanical part, whether rotating, moving, or fixed.
6. Break up all operating instruments such as keys, phones, microphones, etc.
7. Destroy all classes of carrying cases, straps, containers, etc.
8. Bury or scatter all debris.

DESTROY EVERYTHING!

★

Unsatisfactory Report

For U. S. Army Air Force Personnel:

In the event of malfunctioning, unsatisfactory design, or unsatisfactory installation of any of the component units of this equipment, or if the material contained in this book is considered inadequate or erroneous, an Unsatisfactory Report, AAF Form No. 54, or a report in similar form, shall be submitted in accordance with the provisions of Army Air Force Regulation No. 15-54 listing:

1. Station and organization.
2. Nameplate data (type number or complete nomenclature if nameplate is not attached to the equipment).
3. Date and nature of failure.
4. Radio model and serial number.
5. Remedy used or proposed to prevent recurrence.
6. Handbook errors or inadequacies, if applicable.

For U. S. Navy Personnel:

Report of failure of any part of this equipment during its guaranteed life shall be made on Form N. Aer. 4112, "Report of Unsatisfactory or Defective Material," or a report in similar form, and forwarded in accordance with the latest instructions of the Bureau of Aeronautics. In addition to other distribution required, one copy shall be furnished to the inspector of Naval Materiel (location to be specified) and the Bureau of Ships. Such reports of failure shall include:

1. Reporting activity.
2. Nameplate data.
3. Date placed in service.
4. Part which failed.
5. Nature and cause of failure.
6. Replacement needed (yes—no).
7. Remedy used or proposed to prevent recurrence.

For British Personnel:

Form 1022 procedure shall be used when reporting failure of radio equipment.

SECTION I
GENERAL DESCRIPTION

1. GENERAL.

a. FUNCTION.—Radio Receiving Set AN/CRW-2 is a superregenerative-type radio receiver which constitutes the receiving end of a radio control system. When installed in an object, it permits radio control of the object through reception of signals from Radio Transmitting Equipment RC-186.

b. OPERATION.—Radio Receiving Set AN/CRW-2 is designed to receive carrier frequencies of between 50 and 100 megacycles. This range is covered by five sets of plug-in tuning units, each set permitting tuning of the receiver over a 10-megacycle band. A set consists of an r-f unit and a detector unit. However, the equipment is presently being supplied with only two sets of tuning units, one set for the 50 to 60-megacycle band and the other for the 80 to 90-megacycle band. The r-f carrier is modulated by audio frequencies of 475 and 3000 cps, not simultaneously. Each audio frequency operates a relay in the receiver, which in turn actuates a mechanism controlling a function of the object in which the receiver is installed.

c. POWER REQUIREMENTS.—Power for operation of the receiver is derived from an external 19 to 23 volt source. High voltage is developed by a dynamotor having an output of 185 to 240 volts d-c. The dynamotor input current is 1.1 amperes, output current about 0.06 ampere.

2. EQUIPMENT SUPPLIED.

Quantity Per Equipment	*Name of Unit*	*Army Nomenclature*	*Dimensions (inches)*	*Weight (pounds)*
1	Radio Receiving Set consisting of:	AN/CRW-2	9 1/16 x 8 1/16 x 4 7/16	13
	1 Radio Receiver	R-74/CRW-2		
	1 Tuning Unit	TN-37/CRW-2		
	1 Tuning Unit	TN-38/CRW-2		
	or			
	1 Radio Receiver	R-74/CRW-2		
	1 Tuning Unit	TN-43/CRW-2		
	1 Tuning Unit	TN-44/CRW-2		
1	Antenna Cable		15" long	
1	Aligning tool (Emerson part No. WH-F-280)			

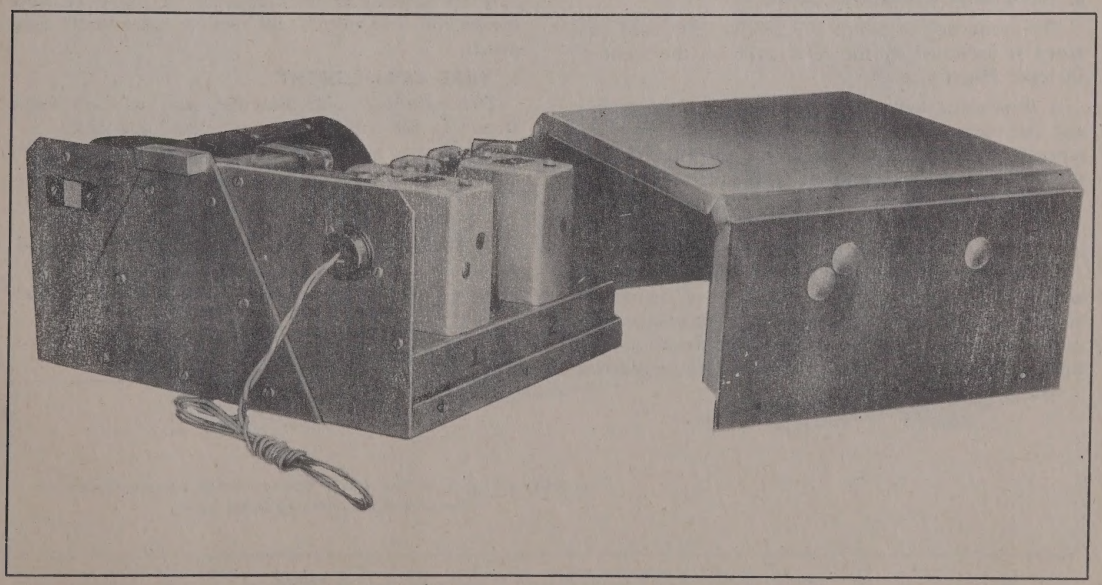


Figure 1-1. Radio Receiving Set AN/CRW-2

3. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

The following list contains the equipment necessary for test and adjustment of Radio Receiving Set AN/-CRW-2.

a. Radio Transmitting Equipment RC-186. (Optional)

b. A milliammeter (0 to 20 ma.)

c. A power source to supply 19-23 volts d-c.

d. Test Box TS-154/CRW-2.

e. Plug PL-55.

f. A signal generator capable of generating a carrier frequency of 50 to 100 megacycles which can be modulated 75 percent by audio frequencies of 475 and 3000 cps accurate to within ± 1 percent. The r-f output must be variable between 50 and 20,000 microvolts.

g. Audio oscillator with an output of 475 and 3000 cycles accurate to within $\pm$ 1 percent.

4. DESCRIPTION.

a. ELECTRICAL.—Radio Receiving Set AN/CRW-2 consists of a six-tube amplitude modulation receiver R-74 ( )/CRW-2. It contains two plug-in tuning units: an r-f unit and a detector unit, each of which is tuned to the desired frequency channel. The receiver is capable of responding to 475 cycle and 3000 cycle audio frequencies, each of which operates one side of the relay in the receiver.

b. MECHANICAL.—The entire unit is contained in a metal cabinet $9\frac{1}{16}$" x $8\frac{1}{16}$" x $4\frac{7}{16}$" and weighs 13 pounds. (See fig. 1-1.) The antenna lead is connected to Plug P-101.

5. FREQUENCY COLOR CODE.

The frequency to which the receiver has been pretuned is indicated by the color code on the front of the case. (See fig. 2-1.)

A three-color code system is used in which the first and last colors are the same and indicate the frequency range. The middle color indicates the frequency channel within the band. Five colors are used, since there are five 10-megacycle frequency bands (covering the range from 50 to 100 mc) and five frequency channels within each band. The colors respectively for the lowest, second from lowest, third from lowest, fourth from lowest and highest frequency are: black, brown, red, orange and yellow. Thus a color code of orange-red-orange indicates the fourth from lowest frequency band and the third channel in that band, which is 84 megacycles.

The color code for the frequencies now in use is as follows:

Color	*Frequency in Mc.*
Black-black-black	$53\frac{1}{3}$
Black-brown-black	$54\frac{2}{3}$
Black-red-black	56
Black-orange-black	$57\frac{1}{3}$
Black-yellow-black	$58\frac{2}{3}$
Orange-black-orange	80
Orange-brown-orange	82
Orange-red-orange	84
Orange-orange-orange	86
Orange-yellow-orange	88

Each plug-in unit will be identified by a dot of color as follows:

Color of dot	*FR-Unit*	*Detector Unit*
Black	TN-37( )/CRW-2	TN-38( )/CRW-2
Brown	TN-39( )/CRW-2	TN-40( )/CRW-2
Red	TN-41( )/CRW-2	TN-42( )/CRW-2
Orange	TN-43( )/CRW-2	TN-44( )/CRW-2
Yellow	TN-45( )/CRW-2	TN-46( )/CRW-2

Some Radio Transmitting Equipments RC-186-T1 may be frequency color-coded by a single color. The corresponding color code to be used on the receiver in such cases is as follows:

Transmitter	*Receiver*
White	Orange-black-orange
Red	Orange-brown-orange
Blue	Orange-red-orange
Yellow	Orange-orange-orange
Black	Orange-yellow-orange

If the transmitter is color-coded in the three color system, the transmitter and receiver color codes must match.

6. TUBE COMPLEMENT.

The following table lists the tubes used in Radio Receiving Set AN/CRW-2 and their functions.

Reference No.	*Type*	*Function*
V-101	JAN-6SG7	Buffer
V-102	JAN-6J5	Detector
V-103	JAN-6SL7GT	Audio amplifier and quench oscillator
V-104	JAN-6SL7GT	Two-tuned amplifier stages
V-105	JAN-6SL7GT	Diode rectifier
V-106	JAN-6SN7G7	Relay tube

SECTION II
INSTALLATION AND ADJUSTMENT

1. GENERAL.

Original installation of Radio Receiving Set AN/-CRW-2 is made by the manufacturer; however, an occasion might arise in the field making it necessary to remove the receiver, test it, and reinstall it.

2. REMOVAL OF THE RECEIVER.

a. Remove the 10 bolts which hold the rear cover on the parent equipment in place.

b. Remove associated equipment.

c. Pull the receiver's power plug loose.

d. Detach the antenna cable connection.

e. Remove the bolt holding the receiver to the parent equipment and remove the receiver.

3. INSTALLATION.

a. Lower Radio Receiving Set AN/CRW-2 on the two pins in the parent equipment so that these pins are inserted in the mounting holes, figure 2-2, in the receiver case.

b. Plug the receptacle into the power plug, figure 2-2, on the bottom of the receiver. It may be necessary to do this while lowering the receiver into place.

c. Secure the receiver by fastening the bolt through the mounting support, figure 2-1, on top of the receiver case.

d. Connect the antenna leads (shown in figure 2-1) to the antenna connection on the parent equipment.

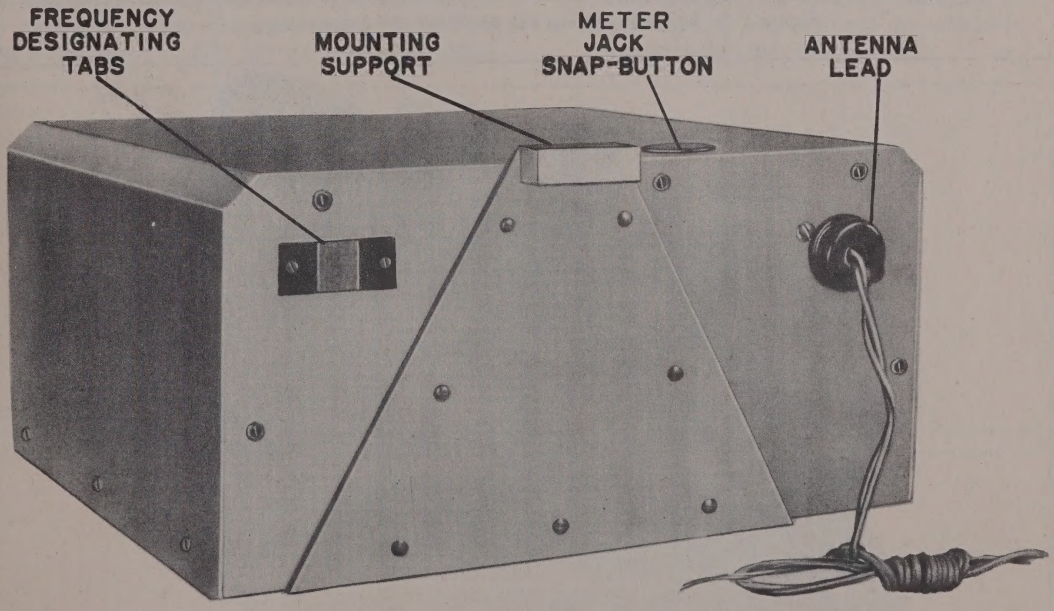
4. ADJUSTMENT.

a. EQUIPMENT REQUIRED.

(1) A power source to supply 19-23 volts d-c.

(2) A milliammeter (0-20 ma.).

(3) A signal generator capable of generating a carrier frequency of from 50 to 100 megacycles which



Note: On some receivers the snap-button may be removed and cellulose tape substituted.

Figure 2-1. Radio Receiving Set AN/CRW-2—Front View

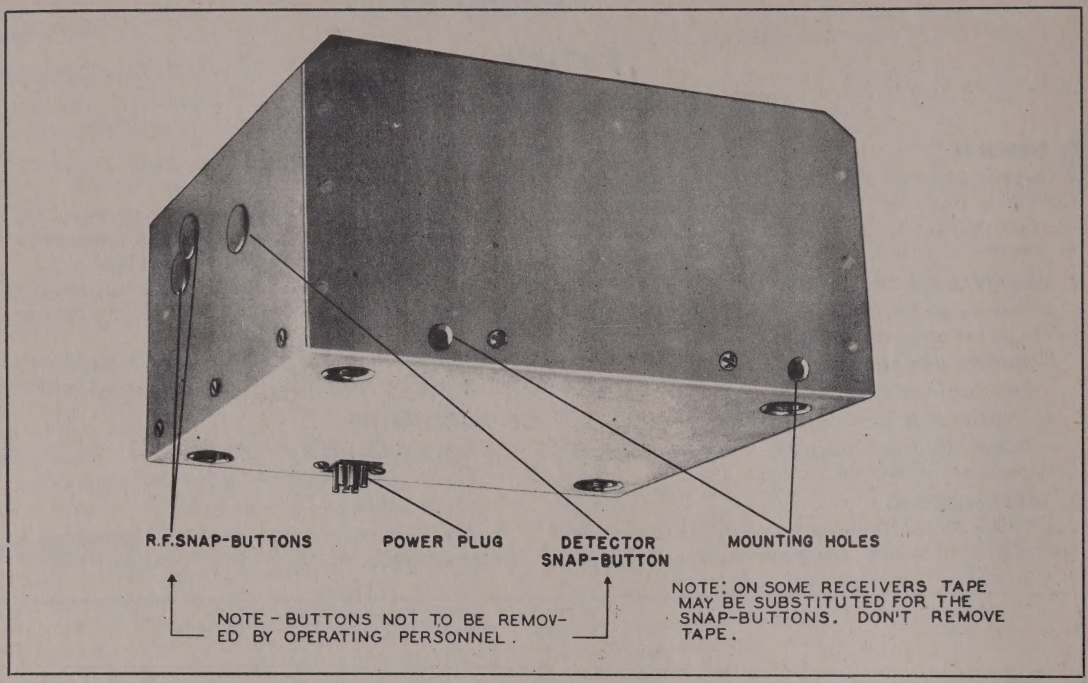

R.F.SNAP-BUTTONS
POWER PLUG
DETECTOR SNAP-BUTTON
MOUNTING HOLES
NOTE - BUTTONS NOT TO BE REMOVED BY OPERATING PERSONNEL.
NOTE: ON SOME RECEIVERS TAPE MAY BE SUBSTITUTED FOR THE SNAP-BUTTONS. DON'T REMOVE TAPE.

Figure 2-2. Radio Receiving Set AN/CRW-2—Bottom View

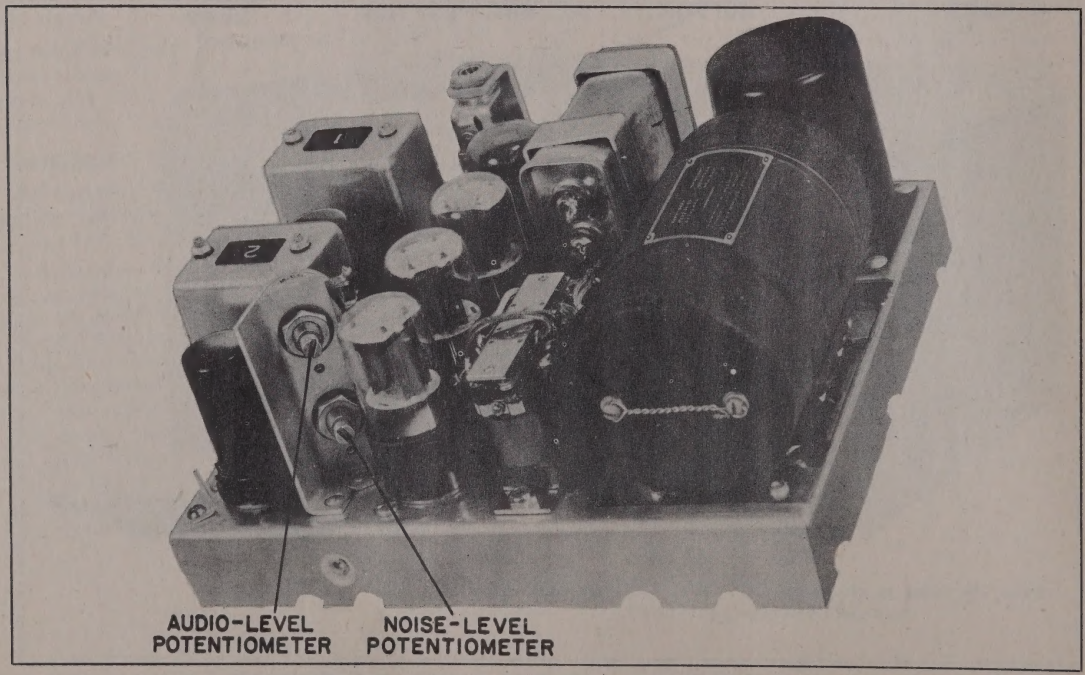


Figure 2-3. Radio Receiving Set AN/CRW-2—Interior Rear View

can be modulated 75 percent at audio frequencies of 475 and 3000 cps accurate to within 1 percent. The r-f output must be variable between 50 to 20,000 microvolts.

(4) Audio oscillator, as specified above.

(5) An aligning tool (Emerson part number WH-F-280).

b. PROCEDURE.

(1) Connect the signal generator to the receiver antenna leads.

(2) Adjust the signal generator to the proper frequency as determined from the color code on the receiver, or to the desired frequency if it is to be changed.

(3) Plug the milliammeter into the jack on the top of the receiver. (See fig. 2-1.)

(4) With a signal amplitude of approximately 20,000 microvolts, align the detector stage for maximum reading on the milliammeter. The detector adjustment is located on the side of the receiver as shown in figure 2-2.

(5) Reduce the signal input until the milliammeter reads approximately 5 milliamperes. This can be done by diminishing the output of the signal generator or by moving the receiver away from Radio Transmitting Equipment RC-186. Align the r-f stage (two adjustments) for maximum reading on the milliammeter. While making this adjustment, maintain the milliammeter reading at about 5 milliamperes by reducing the signal input as the reading increases.

(6) With the carrier frequency modulated at 475 cps, adjust the tuning adjustment potentiometer R-117 for maximum reading on the milliammeter. This adjustment is shown in figure 5-2.

(7) Repeat step (6) above using 3000 cps and the corresponding potentiometer, R-125.

(8) With no signal input, adjust the noise-level potentiometer R-104 until the milliammeter reading does not exceed 0.75 milliamperes.

(9) Adjust the audio-level potentiometer R-111, figure 2-3 until the same milliammeter reading is obtained for both 475 cycles and 3000 cycles input.

c. FREQUENCY CHANGE.—To change the receiver from one frequency range to another, it is necessary to change the detector and r-f plug-in tuning units. In order to change frequencies within the band, follow the procedure outlined in section 4, paragraph *b.*, using the desired frequency on the signal generator.

Note

When changing the operating frequency of the receiver, be sure to change the color code to conform with the new frequency.

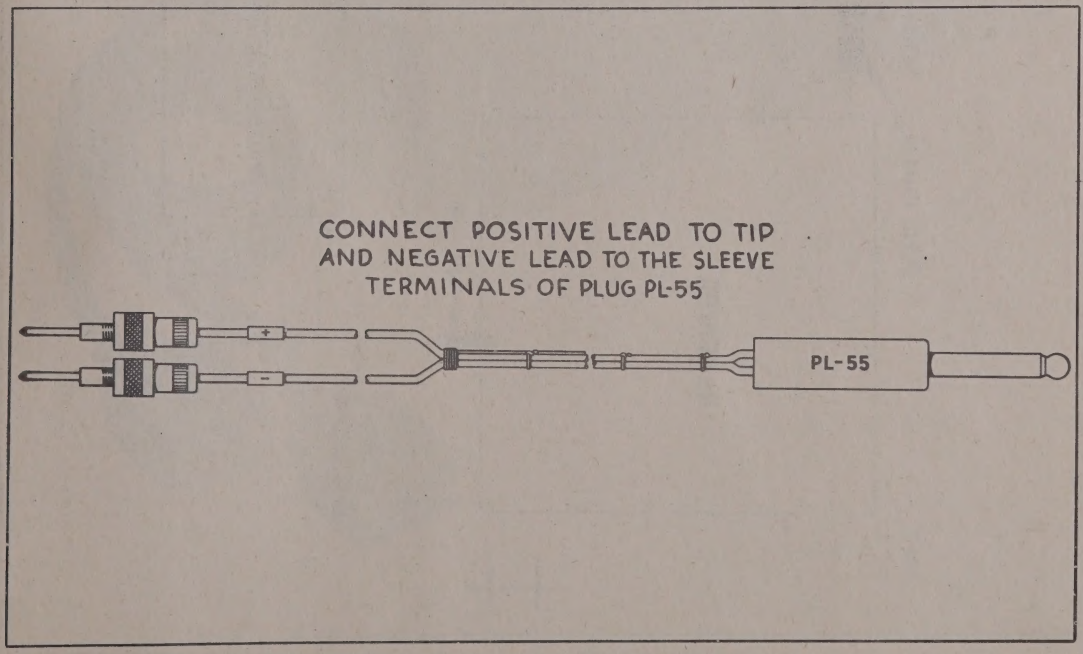


Figure 2-4. Cord for Connection of Milliammeter

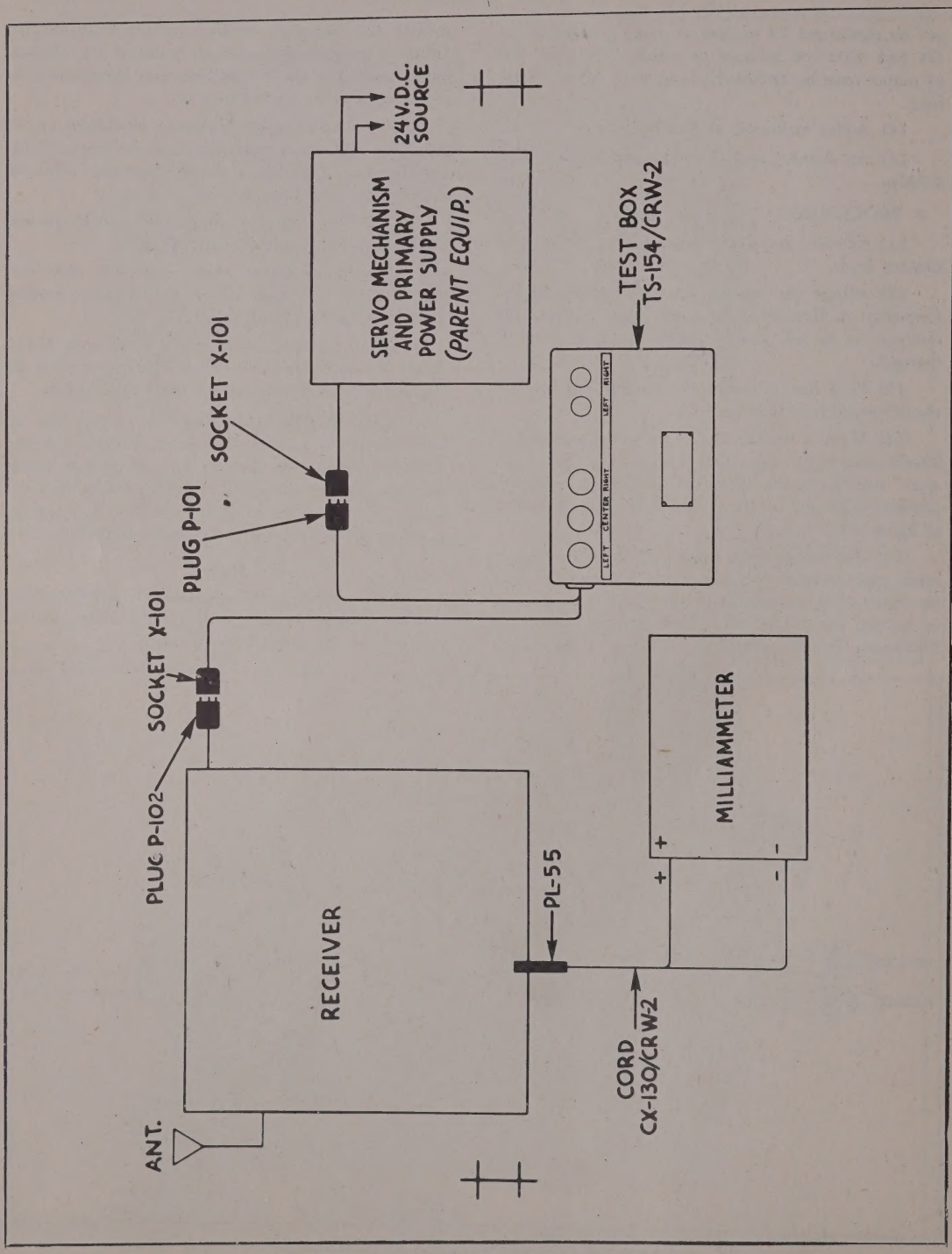


Figure 3-1. Connection of Test Box TS-154/CRW-2

SECTION III
OPERATION

1. GENERAL.

The functioning of Radio Receiving Set AN/CRW-2 is controlled through Control Box BC-1156 which is part of Radio Transmitting Equipment RC-186.

2. STARTING THE EQUIPMENT.

To operate Radio Receiving Set AN/CRW-2, insert the power plug, figure 2-2, into its receptacle in the parent equipment.

3. STOPPING THE EQUIPMENT.

To stop the equipment, disconnect the power plug.

4. PREOPERATIONAL TEST.

While it is possible to check the operation of Radio

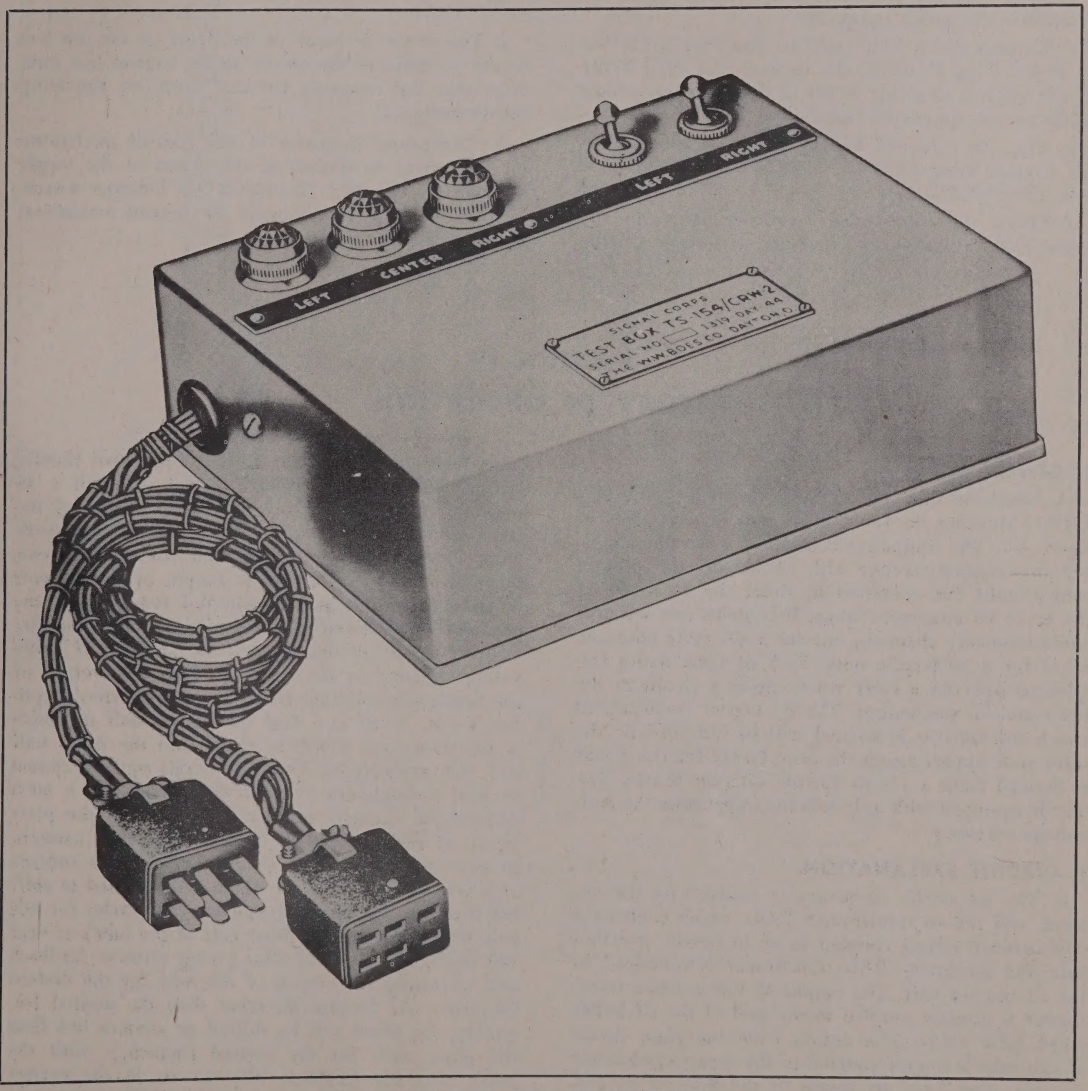


Figure 3-2. Test Box TS-154/CRW-2

Receiving Set AN/CRW-2 roughly by testing the current in the cathode circuit of the relay tubes with a milliammeter, it is advisable to test the equipment prior to operation with Test Box TS-154/CRW-2. Although the signal source specified for the equipment is Radio Transmitting Equipment RC-186, r-f and a-f signal generators may be substituted.

a. Place Radio Receiving Set AN/CRW-2 and parent equipment 100 feet from Radio Transmitting Equipment RC-186.

b. Remove the rear cover of the parent equipment by removing the eight bolts.

c. Make sure that the antenna is connected from the receiver to the parent equipment.

d. Connect socket X-101 of Test Box TS-154/CRW-2 to Power Plug P-102 of the receiver and Plug P-101 of the test box to socket X-101 of the servo mechanism in the parent equipment. (See fig. 3-1.)

e. Plug the 0-20 ma. milliammeter into the jack on the receiver using Cord CX-130/CRW-2 (part of Test Box TS-154/CRW-2).

f. Check the color-coded frequency chart on the transmitter to make sure that the frequency of the transmitter is the same as that of the receiving set.

g. Turn on Radio Transmitting Equipment RC-186 and set power switch to "NORMAL" position.

h. When the control stick of Control Box BC-1156 is in the "CENTER" (neutral) position, the milliammeter connected to the receiver should read less than 0.75 milliamperes and the "CENTER" indicator lamp of Test Box TS-154/CRW-2 should light.

i. With the control stick of Control Box BC-1156 in either the "RIGHT" or "LEFT" position, the corresponding indicator lamp of Test Box TS-154/CRW-2 should light, and the meter should read from 3 to 5 milliamperes.

j. The proper response of the lights on the test box to the positions of the switch on the control box indicates that the receiving set and relays are operating satisfactorily.

k. The proper response of the control mechanism on the parent equipment to the action of the toggle switches on Test Box TS-154/CRW-2 indicates a satisfactory operating condition of the control mechanism of the parent equipment.

SECTION IV
THEORY OF OPERATION

1. GENERAL.

A functional diagram of Radio Receiving Set AN/CRW-2 showing the function of each stage is given in figure 4-1. The equipment consists of a six-tube amplitude modulation receiver with r-f and detector plug-in tuning units for operation in either the 50 to 60 or the 80 to 90 megacycle range. It contains two selective audio-frequency channels, one for a 475-cycle note, the other for a 3000-cycle note. Each of these audio frequencies operates a relay which closes a circuit in the bomb-control mechanism. The r-f carrier frequency to which the receiver is aligned will be indicated by the color code appearing on the case. Power for the circuit is derived from a 19- to 23-volt external source. The unit is equipped with a dynamotor to generate the high voltage necessary.

2. CIRCUIT EXPLANATION.

a. The r-f carrier frequency is received by the antenna and fed to transformer T-101 which contains a double-tuned circuit coupled so as to obtain optimum gain and selectivity. This transformer is contained in the r-f plug-in unit. The output of this antenna transformer is directly coupled to the grid of the r-f buffer stage, tube V-101. The output from the plate circuit of this tube is loosely coupled to the super-regenerative detector tube V-102 by means of the detector plug-in transformer T-102. The detector is a conventional super-regenerative detector utilizing a modified Hartley circuit. The grid is returned to B+ through a 10 megohm resistor to increase the audio output of the stage without causing it to block. The quench oscillator V-103-A used in conjunction with the detector operates at 132 kc. The audio output of the detector is taken from the grid circuit and fed through the noise-level potentiometer R-104 into an audio amplifier stage V-103-B. R-104 controls the amount of audio voltage utilized in the audio section. The output of the first audio amplifier is fed into the selective amplifier V-104. V-104 is a dual triode, one half of which is receptive to a 475-cycle signal and the other half to a 3000-cycle signal. Thus a 475-cycle signal is caused to pass through one channel (V-104-A) and a 3000 cycle signal through another (V-104-B). In the plate circuit of each half of V-104 is a phase shift network in series with a feedback circuit. The network consists of a series of pi networks which are designed to shift the phase of the desired frequency (475 cycles for one and 3000 cycles for the other half of the tube) as near 180 degrees as possible, thus giving positive feedback and increasing the output of the tube for the desired frequency. At frequencies other than the desired frequency, the phase will be shifted an amount less than the phase shift for the desired frequency, with the result that the feedback will not be in the correct phase to be completely regenerative. The 3000-cycle

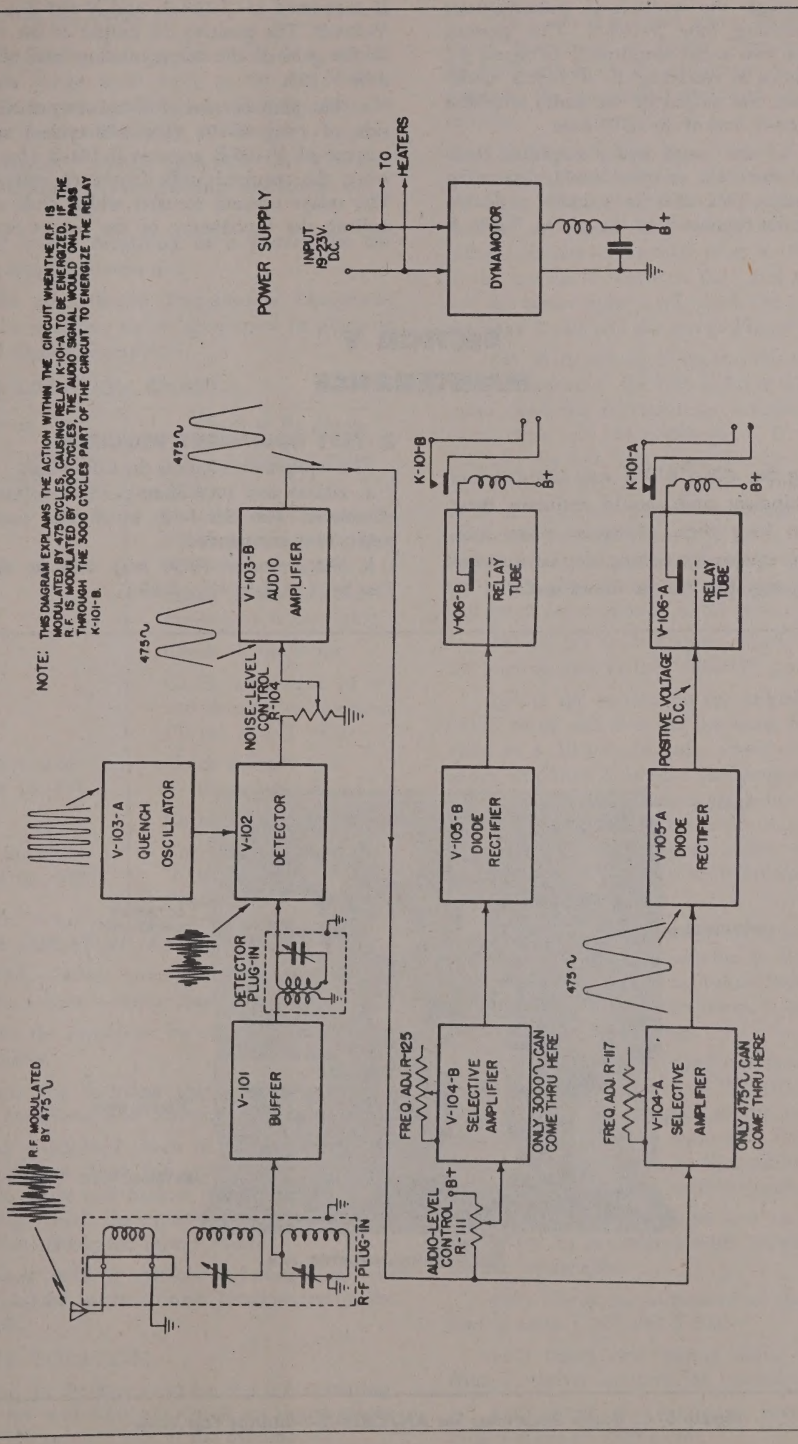

NOTE: THIS DIAGRAM EXPLAINS THE ACTION WITHIN THE CIRCUIT WHEN THE R.F. IS MODULATED BY 475 CYCLES, CAUSING RELAY K-101-A TO BE ENERGIZED. IF THE R.F. IS MODULATED BY 3000 CYCLES, THE AUDIO SIGNAL WOULD ONLY PASS THROUGH THE 3000 CYCLES PART OF THE CIRCUIT TO ENERGIZE THE RELAY K-101-B.
R.F. MODULATED BY 475 ~
R-F PLUG-IN
V-101 BUFFER
DETECTOR PLUG-IN
V-103-A QUENCH OSCILLATOR
V-102 DETECTOR
NOISE-LEVEL CONTROL R-104
V-103-B AUDIO AMPLIFIER
475 ~
AUDIO-LEVEL CONTROL R-111
FREQ. ADJ. R-125
V-104-B SELECTIVE AMPLIFIER
ONLY 3000 ~ CAN COME THRU HERE
V-105-B DIODE RECTIFIER
V-106-B RELAY TUBE
K-101-B
B+
FREQ. ADJ. R-117
V-104-A SELECTIVE AMPLIFIER
ONLY 475 ~ CAN COME THRU HERE
V-105-A DIODE RECTIFIER
POSITIVE VOLTAGE D.C.
V-106-A RELAY TUBE
K-101-A
POWER SUPPLY
INPUT 18-32 V. D.C.
DYNAMOTOR
TO HEATERS

Figure 4-1. Radio Receiving Set AN/CRW-2—Functional Diagram

signal comes through the audio-level potentiometer R-111 before reaching tube V-104-B. This permits equalization of the two audio amplitudes. In figure 4-1 the receiver is shown as receiving the 475-cycle modulated carrier. Hence the output of the audio amplifier feeds into the V-104-A half of the 6SL7 tube.

b. The output of the tuned audio amplifier feeds into either side of the diode rectifier V-105, depending upon the frequency. This tube is actually a double triode with the grids connected to the plates. V-105-A is connected to V-104-A, and V-105-B is connected to V-104-B. The positive d-c output of the rectifier is fed to the grid of the corresponding half of a dual relay tube V-106.

c. The plate current of V-106-A operates the K-101-A side of relay K-101 (for 475 cycles) and the plate current of V-106-B actuates K-101-B (for 3000 cycles) when the required audio-frequency voltage is present. The relays operate contacts which close a circuit controlling the functioning of the parent equipment.

SECTION V
MAINTENANCE

1. GENERAL.

Radio Receiving Set AN/CRW-2 was adjusted and aligned before shipment and should maintain these adjustments for a long time. However, when malfunctioning of the equipment occurs, the information in the following paragraphs will be found useful.

2. TEST EQUIPMENT REQUIRED.

Test equipment requires the following:

a. 20,000 and 1000-ohms-per-volt voltmeters and an ohmmeter. Test Set I-56, which also contains a tube tester, is recommended.

b. Milliammeter (0-20 ma) such as the meter on Test Set I-56, I-56-H or I-56-J.

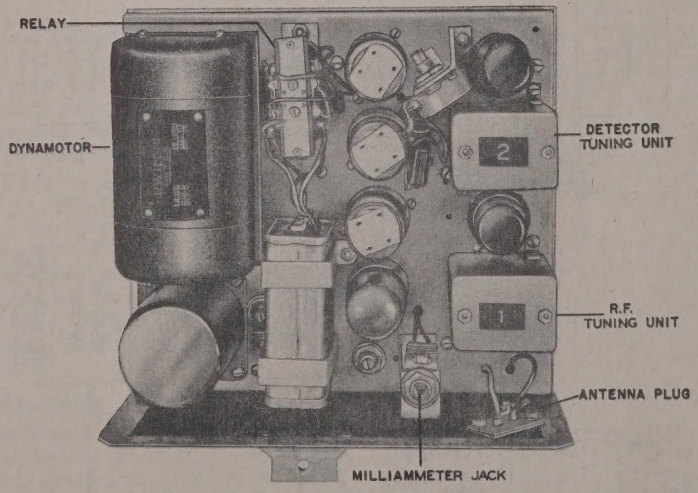


Figure 5-1. Radio Receiving Set AN/CRW-2—Interior Top View

c. Test Box TS-154/CRW-2.

d. Signal Generator, such as GR-804-B or C, which will cover the range from 53⅓ to 88 mc. and is capable of 75 percent modulation. Output must be variable between 50 and 20,000 microvolts.

e. Audio-frequency signal generator for 475 and 3000 cycles, capable of modulating GR-804-B or C above.

f. A power source consisting of a battery, or the equivalent, to supply 24 volts d-c.

g. In certain cases, Radio Transmitting Equipment RC-186 may be used for signal generation in place of the r-f and a-f signal generators.

3. TROUBLE LOCATION CHART.

Symptom	*Check to Be Made*
Set does not operate for either 475 or 3000 cycles.	Check frequency color code.
	Check to see that the power plug is properly connected.
	Check to see that the dynamotor is operating.
	Check all the tubes.
	Check alignment of r-f and detector tuning units (T-101 and T-102).
Set operates for 3000 cycles but not for 475.	Check tubes V-104, V-105 and V-106.
	Check relay K-101-A.
Set operates for 475 cycles but not for 3000.	Check tubes V-104, V-105 and V-106.
	Check relay K-101-B.

4. TROUBLE LOCATION AND REMEDIES.

a. GENERAL.—When trouble shooting, it will be found helpful to observe certain basic rules.

(1) Check the complaint by observing and recognizing the trouble.

(2) Locate the function that is inoperative by studying the functional and schematic diagrams.

(3) Make a physical check of the set. Smell for burned out resistors; look for unlit (or cold) tubes; look for loose wires and broken connections; feel for hot components; check the input and output plugs for poor connection; check the power source.

(4) Proceed with a systematic isolation of the trouble as explained in the trouble location and in the next paragraph.

b. CIRCUIT ISOLATION.

(1) Check the dynamotor to see that it is operating. If not, check for continuity and check for shorts on the B+ side and the primary side of the dynamotor.

(2) Connect a signal source to the receiver (either signal generators or Radio Transmitting Equipment RC-186) and check the alignment to see that it corresponds to the color-coded frequency on the front of the receiver.

(3) Connect Test Box TS-154/CRW-2 to the receiver as explained in Sec. III. If the center light does not light in the "NEUTRAL" position, check for current at the meter jack, which is in series with the cathode circuits of the relay tubes V-106-A and V-106-B. If the current is between 0.25 and 0.75 milliamperes and the center light is off, check for continuity between the relay K-101 and the power Plug P-102.

(4) With the signal on and the control stick in the "LEFT" position, the left light should go on. If not, again check the milliammeter current. It should be between three and five milliamperes. If the current is correct and the left light is off, but the center light went on in the "NEUTRAL" position of the control stick, check the relay for proper adjustment. The relay should operate at 2.5 milliamperes. If both the center and left lights are inoperative, the trouble is likely to be between the power plug and the relay. Check the relay carefully and check for continuity at the power plug.

(5) In the same manner, check the receiver with the control stick in the "RIGHT" position.

(6) If the current on the milliammeter is not between three and five milliamperes, feed either a 475-cycle or a 3000-cycle audio signal to the grid of the audio amplifier V-103-B. The proper relay should be activated. If it is not, check the other audio channel. If either or both channels are faulty as indicated by inactivated relays, check the tubes, socket voltages and socket resistances in accordance with information in the following paragraphs.

(7) Examine the tuning adjustment potentiometers R-117 and R-125 to determine if the glyptal seal has been broken. If the seal is broken, indicating tampering, realign these two potentiometers to see if the relay can be activated at any settings.

(8) If the receiver operates satisfactorily with an audio signal on the grid of V-103-B, but does not operate with an input signal to the antenna, check the noise control R-104 to make sure that it has not been turned down. Adjust it so that milliammeter reads 0.5 milliamperes without a carrier signal.

(9) Check the voltages and resistances of V-101 and V-102 in accordance with information in the following paragraphs.

(10) Check the alignment of the r-f and detector tuning units T-101 and T-102.

(11) Insert new tuning units or units removed from a receiver in operating condition.

(12) Check the continuity between the antenna plug and the r-f tuning unit.

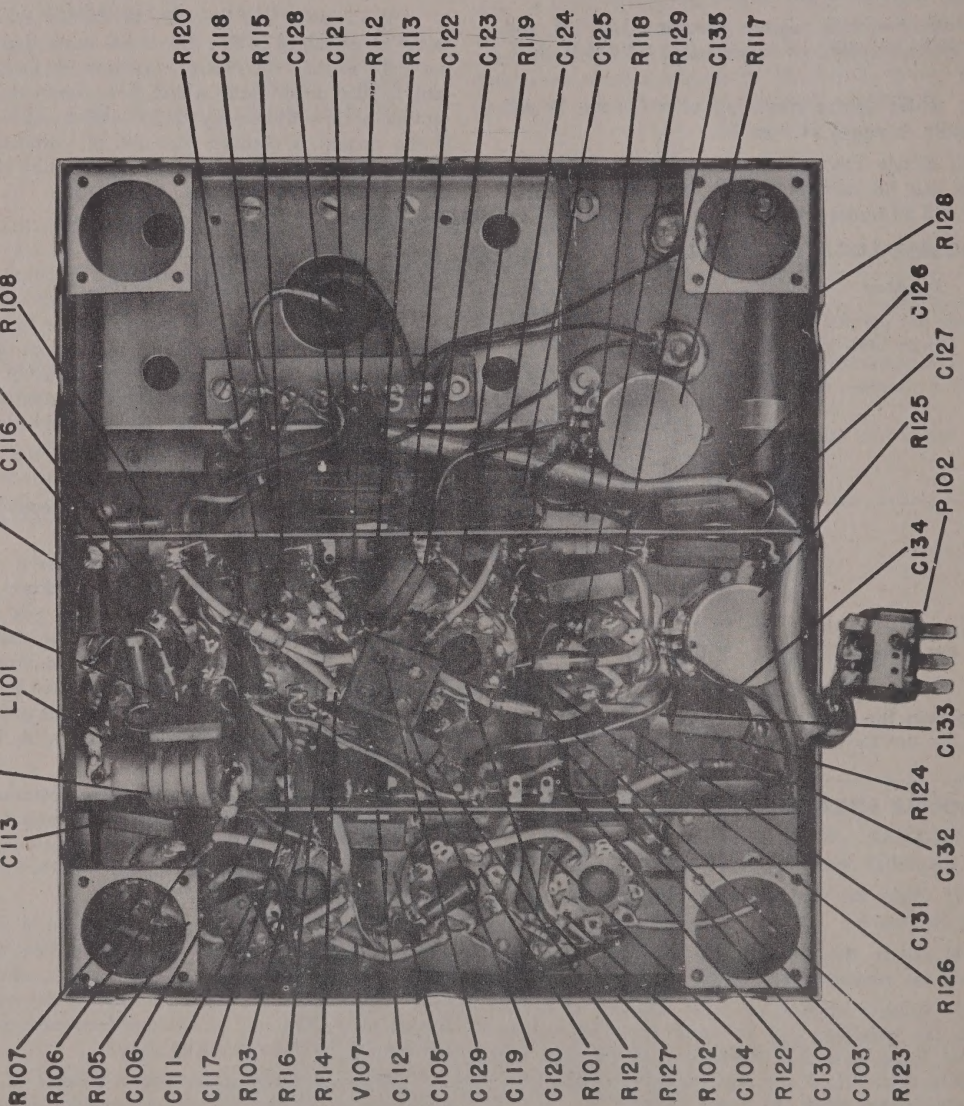


Figure 5-2. Interior Bottom View—Parts Location

5. RESISTANCE CHART.

The following resistance readings were measured from pin to ground with a 1000 ohm-per-voltmeter. The values are expressed in ohms.

	Pin 1	*Pin 2*	*Pin 3*	*Pin 4*	*Pin 5*	*Pin 6*	*Pin 7*	*Pin 8*
V-101	0	2.5	4700	0	4700	180,000	0	1000
V-102	0	3	27 K	15 meg.	10 meg.	10 meg.	4	0
V-103	370,000	530,000	1000	10,000	90 K	0	3.5	2
V-104	5 meg.	105,000	600	4.7 meg.	110 K	600	2.5	2.5
V-105	0	0	1.15 meg.	0	0	1.05 meg.	2.5	0
V-106	3.75 meg.	10 K	2.5	3.75 meg.	10 K	3.2	3.2	3

6. VOLTAGE CHART.

The following voltages were measured from pin to ground with a 1000 ohm-per-volt meter.

	Pin 1	*Pin 2*	*Pin 3*	*Pin 4*	*Pin 5*	*Pin 6*	*Pin 7*	*Pin 8*
V-101	0	7.2	7.4	0	7.4	95	0	204
V-102	0	7.2	100	−.26	−3.4	−2.5	14.5	0
V-103	0	38	.24	−6	35	0	14	21.5
V-104	0	95	.95	0	95.3	.95	10	7.6
V-105	0	0	.75	0	0	2.43	7.65	0
V-106	0	185	15	0	197	15	15	21.5

The following voltages were measured from pin to ground with a 20,000 ohm-per-volt meter.

	Pin 1	*Pin 2*	*Pin 3*	*Pin 4*	*Pin 5*	*Pin 6*	*Pin 7*	*Pin 8*
V-101	0	7.4	7.5	0	7.5	132	0	202
V-102	0	7.1	98	−7.6	−3.4	−10	14.5	0
V-103	−.15	45.5	.3	−6.5	37.7	0	14.5	22
V-104	0	105.5	1.15	0	105	1.1	10.4	7.65
V-105	0	0	4.1	0	0	2.5	7.5	0
V-106	.2	195	15	.1	200	15	15	21.5

SECTION VI

SUPPLEMENTARY DATA

TEST BOX TS-154/CRW-2. This is the test equipment used to test Radio Receiving Set AN/CRW-2. It consists of the following:

Stock No.	*Article*
3F4325-154	Test Box TS-154/CRW-2, including the following:
3E6000-130	1—Cord CX-130/CRW-2
3E6000-131	1—Cord CA-131/CRW-2
2Z5938	3—Lamp LM-38, installed in sockets

SECTION VII
PARTS CATALOGUE

Introduction

Table of Parts

The parts listed in this table do not constitute a complete electrical and mechanical breakdown of the equipment. The table lists all electrical parts together with such operative mechanical parts as are subject to loss or failure, with the exception of structural and minor parts such as standard bolts, screws, nuts, and the like. In some instances individual detail parts of a sub-assembly may not be listed as separate items, since replacement of such items is impractical.

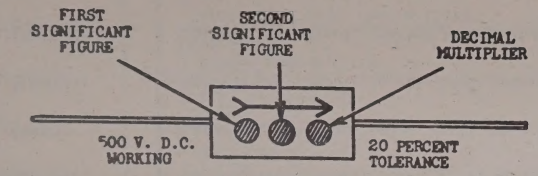
Ordering of Spare Parts

Each Service using this list has established certain depots and service groups for the storage and issue of spare parts to its organizations requiring them. The regulations of each Service should be studied to determine the method and source for requisitioning spare parts. The information in this list, as to manufacturer's or contractor's name, type, model, or drawing number, is not to be interpreted as authorization to field agencies to attempt to purchase identical or comparable spare parts directly from the manufacturer or a wholesale or retail store except under emergency conditions as covered by existing regulations of the Service concerned.

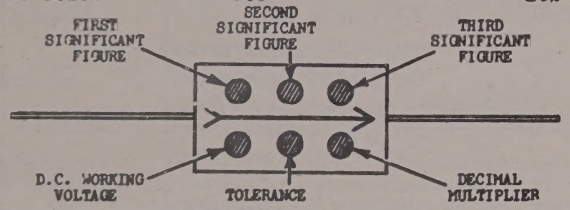
U. S. Army Personnel: This table is for information *only* and is not to be used as a basis for requisitioning parts. Authorities for obtaining maintenance items are as follows: 1. For using organizations: applicable Service publications of the 00-30 series of AAF Technical Orders. 2. For higher maintenance and supply echelons: applicable Service publications of the 08-55 series of AAF Technical Orders.

RMA COLOR CODES

FOR CAPACITORS (MMFD)



COLOR	NUMERAL	VOLTS	MULTIPLIER	TOLERANCE
BLACK	0		1	
BROWN	1	100	10	1%
RED	2	200	100	2%
ORANGE	3	300	1,000	3%
YELLOW	4	400	10,000	4%
GREEN	5	500	100,000	5%
BLUE	6	600	1,000,000	6%
VIOLET	7	700	10,000.000	7%
GRAY	8	800	100,000,000	8%
WHITE	9	900	1,000,000,000	9%
GOLD		1000	0.1	5%
SILVER		2000	0.01	10%
NO COLOR		500		20%

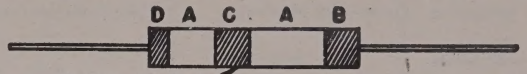


FOR RESISTORS (OHMS)

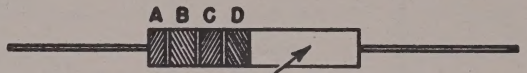
COLOR	A 1ST DIGIT	B 2ND DIGIT	C MULTIPLIER
SILVER			0.01
GOLD			0.1
BLACK		0	1.0
BROWN	1	1	10
RED	2	2	100
ORANGE	3	3	1,000
YELLOW	4	4	10,000
GREEN	5	5	100,000
BLUE	6	6	1,000,000
PURPLE	7	7	10,000,000
GRAY	8	8	100,000,000
WHITE	9	9	

D - TOLERANCE CODE:

GOLD = 5% SILVER = 10% NO COLOR = 20%



OLD COLOR ARRANGEMENT



NEW COLOR ARRANGEMENT

BODY COLOR (NEW COLOR ARRANGEMENT ONLY) INDICATES TYPE OF RESISTOR, AS FOLLOWS:-

BLACK - COMPOSITION, NON-INSULATED
TAN, OLIVE OR WHITE - COMPOSITION, INSULATED
DARK BROWN - WIRE-WOUND, INSULATED

TABLE OF PARTS

NOTE: Parts listed which are indicated by a # sign in Column 2 are not available as spare parts and are listed for reference purposes only.

RADIO RECEIVING SET AN/CRW-2

Reference Symbol	*Army Stock No. Navy Stock No. British Ref. No.*	*NAME OF PART and DESCRIPTION*	*FUNCTION*	*MFR. and DESIG. or AWS TYPE*	*CONT. or GOVT. DWG. or SPEC. No.*
C-101		CAPACITOR: Variable; air dielectric; 4-20 micromicrofarad; one half of Sickles unit #7343.	R-F tuning condenser	Sickles	WH-C-307
C-102		CAPACITOR: Same as C-101.	Tuning condenser		
C-103	3D9250-18.2	CAPACITOR: Fixed; silver mica; 250 micromicrofarad ±10%; 400 volts d-c working.	Cathode bypass	Micamold	WH-C-283
C-104		CAPACITOR: Same as C-103.	Screen bypass		
C-105		CAPACITOR: Same as C-103.	Decoupling capacitor		
C-106	3D9500-42	CAPACITOR: Fixed; silver mica; 500 micromicrofarad ±10%.	Bypass	Micamold Electromotive	WH-C-300
C-107	3D9250-18.2	CAPACITOR: Fixed; silver mica; 250 micromicrofarad ±10%; 400 volts d-c working.	Bypass	Micamold	WH-C-283
C-108A	3D9025-31	CAPACITOR. Fixed; silver mica; 25 micromicrofarad ±5%.	Band-spread—detector, high frequency	Micamold Electromotive	WH-C-306
C-108B	3D9015-22.2	CAPACITOR: Fixed; silver mica; 15 micromicrofarad ±5%.	Band-spread—detector, low frequency	Micamold Electromotive	WH-C-324
C-109		CAPACITOR: Variable; air dielectric; 4-20 micromicrofarad; modified Sickles unit #7343.	Detector tuning condenser	Sickles	WH-C-352
C-110	3D9050-33	CAPACITOR: Fixed; silver mica; 50 micromicrofarad ±10%.	Grid blocking condenser	Micamold	WH-C-284
C-111	3D9005-2.4	CAPACITOR: Fixed; silver mica; 5 micromicrofarad ±20%.	Shunt—detector	Micamold Radio Receptor	WH-C-303
C-112	3DA10-228.1	CAPACITOR: Fixed; molded paper; 10,000 micromicrofarad ±10%.	Coupling—audio amplifier	Micamold	WH-C-295
C-113	3K3010211	CAPACITOR: Fixed; mica; 1,000 micromicrofarad ±10%.	Coupling—quench oscillator	Micamold	WH-C-296
C-114	3DA3-5	CAPACITOR: Fixed; mica; 3,000 micromicrofarad ±10%.	Tuning condenser—quench oscillator	Electromotive	WH-C-367
C-115	3K3010211	CAPACITOR: Fixed; mica; 1,000 micromicrofarad ±10%; same as C-113.	Blocking condenser—quench oscillator	Micamold	WH-C-296
C-116	3DA10-228.1	CAPACITOR: Fixed; molded paper; 10,000 micromicrofarad ±10%; same as C-112.	Bypass—quench oscillator	Micamold	WH-C-295
C-117	3K2010132	CAPACITOR: Fixed; silver mica; 100 micromicrofarad ±5%.	Coupling—audio frequency	Micamold	WH-C-286
C-118		CAPACITOR: Same as C-117.	Coupling—audio frequency		

C-119	3K2015132	CAPACITOR: Fixed; silver mica; 150 micromicrofarad ±5%.	Feedback—audio	Micamold Electromotive	WH-C-304
C-120	3DA1-13.2	CAPACITOR: Fixed; mica; 1,000 micromicrofarad ±5%.	Feedback—audio	Electromotive	WH-C-302
C-121	3DKA2-107	CAPACITOR: Fixed; silver mica; 2,000 micromicrofarad ±5%.	Phase shift—audio	Micamold	WH-C-289
C-122	3K2015132	CAPACITOR: Fixed; silver mica; 150 micromicrofarad ±5%; same as C-119.	Feedback—audio	Micamold Electromotive	WH-C-304
C-123	3DA1-13.2	CAPACITOR: Fixed; mica; 1,000 micromicrofarad ±5%; same as C-120.	Feedback—audio	Electromotive	WH-C-302
C-124	3DKA2-107	CAPACITOR: Fixed; silver mica; 2,000 micromicrofarad ±5%; same as C-121.	Phase shift—audio	Micamold	WH-C-289
C-125		CAPACITOR: Same as C-124.	Phase shift—audio		
C-126		CAPACITOR: Same as C-124.	Phase shift—audio		
C-127		CAPACITOR: Same as C-124.	Phase shift—audio		
C-128		CAPACITOR: Same as C-124.	Phase shift—audio		
C-129	3DA10-228.1	CAPACITOR: Fixed; molded paper; 10,000 micromicrofarad ±10%; same as C-112.	Diode coupling	Micamold	WH-C-295
C-130		CAPACITOR: Same as C-129.	Diode coupling		
C-131	3D9650-4	CAPACITOR: Fixed; silver mica; 650 micromicrofarad ±5%.	Phase shift—audio	Micamold	WH-C-291
C-132		CAPACITOR: Same as C-131.	Phase shift—audio		
C-133		CAPACITOR: Same as C-131.	Phase shift—audio		
C-134	3DA10-228.1	CAPACITOR: Fixed; molded paper; 10,000 micromicrofarad ±10%; same as C-112.	Bypass—relay tube	Micamold	WH-C-295
C-135		CAPACITOR: Same as C-134.	Bypass—relay tube		
C-136-1	3DB25-52	CAPACITOR: Fixed; electrolytic; 25 + 25 micromicrofarad; 450 volts d-c working.	Filter—power supply	Cornell Dubilier Sprague	WH-C-281
C-136-2		CAPACITOR: Same as C-136-1.	Filter—power supply		
C-137	3DA100-209	CAPACITOR: Fixed; silver mica; 100,000 micromicrofarad ±20%; 120 volts d-c working.	Heater bypass	Micamold	WH-C-309
C-138	3D9025-54	CAPACITOR: Fixed; silver mica; 25 micromicrofarad ±10%; 300 volts.	Noise filter	Micamold	WH-C-368
	3DA10-53	CAPACITOR: Fixed; mica; 10,000 micromicrofarad ±10%; 300 volts d-c working; located inside the dynamotor.	Noise bypass	Micamold	WH-C-288
D-101		DYNAMOTOR: Continuous duty rating; 28 volt d-c input at 1.1 amperes; 250 volt d-c output at 0.6 amperes, DM-32-A.	High voltage power supply	Furnished by ARL	WH-X-186
J-101	2Z8673.37	RECEPTACLE: Female; 2 prong.	Antenna transmission line connection	Cinch F-82A	WH-S-217

Reference Symbol	*Army Stock No. Navy Stock No. British Ref. No.*	*NAME OF PART and DESCRIPTION*	*FUNCTION*	*MFR. and DESIG. or AWS TYPE*	*CONT. or GOVT. DWG. or SPEC. No.*
J-102	2Z8676.60	RECEPTACLE: Six contacts; maximum 45 volts and 5 amperes; plug prongs are 5/32" wide by 3/64" thick; molded bakelite insulation; black crystal finish on caps.	Dummy; used for protection during shipment.	Jones S-306-FHT	WH-S-216
J-103		JACK, midget: 1 19/32" long; 1 3/64" wide; 3/8" hole.	In series with cathodes of relay tubes, for measuring plate current	Yaxley	WH-L-88
K-101		RELAY: Dual coil construction with armature pivoted centrally between the coils and all contacts normally open; operating current is 3 milliamperes, no operation at 1.8 milliamperes; voltage breakdown: 500 volts between winding and ground, 110 volts a-c between open contacts.	Controls operation of bomb servo mechanism	Allied Control type CS	WH-X-146
L-101		OSCILLATOR ASSEMBLY: Consists of coil, tube, terminal, collar assembly, tape, and 10 strands of No. 42 parallel lay (2.494 mils diam.); universal winding, four crosses per turn, 118 turns per section; total length of wire is 7.9 feet; 2.1 microhenries ±25%.	Quench oscillator	Emerson	WH-T-142
L-102		CHOKE: 2500 turns of No. 32 AWG enameled wire (7.950 mils diam.); inductance measured without d-c is 4.5 henries at 1000 cycles; 1 volt a-c; air gap is 0.003"; butt joint; zinc plating on can and black enamel finish.	Filter inductor	General Transformer	WH-T-129
P-101	2Z3022-17	PLUG: Male; 2 prong.	Antenna transmission line connection	Cinch M-118-A	WH-L-86
P-102	2Z7228-21	JONES PLUG: Six contacts; maximum, 45 volts and 5 amperes; plug prongs are 5/32" wide by 3/64" thick; molded bakelite insulation; black crystal finish on caps.	Connects A supply relay circuits	Jones P-306-CCT	WH-S-229
R-101	3RC21BE472K	RESISTOR: Fixed; carbon; 4700 ohms ±10%; 1/2 watt.	Cathode resistor	I.R.C.	WH-R-388
R-102	3RC21BE184K	RESISTOR: Fixed; carbon; 180,000 ohms ±10%; 1/2 watt.	Screen dropping resistor	I.R.C.	WH-R-383
R-103	3RC21BE273K	RESISTOR: Fixed; carbon; 27,000 ohms ±10%; 1/2 watt.	Detector plate dropping resistor	I.R.C.	WH-R-394
R-104		RESISTOR: Potentiometer; carbon; 500,000 ohms ±20%; 1/2 watt.	Audio noise-level control	Chicago Telephone	WH-R-376
R-105	3RC21BE104J	RESISTOR: Fixed; carbon; 100,000 ohms ±5%; 1/2 watt.	Decoupling resistor	I.R.C.	WH-R-406
R-106	3RC21BE106K	RESISTOR: Fixed; carbon; 10 megohms ±10%; 1/2 watt.	Detector grid resistor	I.R.C.	WH-R-385
R-107	3RC21BE103K	RESISTOR: Fixed; carbon; 10,000 ohms ±10%; 1/2 watt.	Decoupling resistor—quench oscillator	I.R.C.	WH-R-382

R-108	3RC21BE8Z3K	RESISTOR: Fixed; carbon; 82,000 ohms ±5%; ½ watt.	Plate dropping resistor—quench oscillator	I.R.C.	WH-R-391
R-109	3RC21BE103K	RESISTOR: Fixed; carbon; 10,000 ohms ±10%; ½ watt; same as R-107.	Grid resistor—quench oscillator	I.R.C.	WH-R-382
R-110	3RC21BE102K	RESISTOR: Fixed; carbon; 1,000 ohms ±10%; ½ watt.	Cathode resistor—audio amplifier	I.R.C.	WH-R-386
R-111		RESISTOR: Potentiometer; carbon; 500,000 ohms ±20%; ½ watt; same as R-104.	Audio balancing potentiometer	Chicago Telephone	WH-R-376
R-112	3RC21BE474K	RESISTOR: Fixed; carbon; 470,000 ohms ±10%; ½ watt.	Decoupling resistor—audio amplifier	I.R.C.	WH-R-409
R-113	3RC21BE475K	RESISTOR: Fixed; carbon; 4.7 megohms ±10%; ½ watt.	Grid resistor—tuned audio	I.R.C.	WH-R-412
R-114		RESISTOR: Same as R-113.	Grid resistor—tuned audio		
R-115	3RC21BE561K	RESISTOR: Fixed; carbon; 560 ohms ±10%; ½ watt.	Cathode resistor—tuned audio	I.R.C.	WH-R-389
R-116	3RC21BE474K	RESISTOR: Fixed; carbon; 470,000 ohms ±10%; ½ watt; same as R-112.	Decoupling resistor—tuned audio	I.R.C.	WH-R-409
R-117		RESISTOR: Potentiometer; carbon; 500,000 ohms ±20%; ½ watt; same as R-104.	Frequency adjusting pot.—low frequency	Chicago Telephone	WH-R-376
R-118	3RC21BE184J	RESISTOR: Fixed; carbon; 180,000 ohms ±5%; ½ watt.	Phase shift resistor	I.R.C.	WH-R-401
R-119		RESISTOR: Same as R-118.	Phase shift resistor		
R-120	3RC21BE104J	RESISTOR: Fixed; carbon; 100,000 ohms ±5%; ½ watt; same as R-105.	Plate resistor—tuned audio	I.R.C.	WH-R-406
R-121		RESISTOR: Same as R-120.	Plate resistor—tuned audio		
R-122	3RC21BE184J	RESISTOR: Fixed; carbon; 180,000 ohms ±5%; ½ watt; same as R-118.	Phase shift resistor	I.R.C.	WH-R-401
R-123	3RC21BE105K	RESISTOR: Fixed; carbon; 1 megohm ±10%; ½ watt.	Diode load resistor	I.R.C.	WH-R-387
R-124	3RC21BE184J	RESISTOR: Fixed; carbon; 180,000 ohms ±5%; ½ watt; same as R-118.	Phase shift resistor	I.R.C.	WH-R-401
R-125		RESISTOR: Potentiometer; carbon; 500,000 ohms ±20%; ½ watt; same as R-104.	Frequency adjusting pot.—high frequency	Chicago Telephone	WH-R-376
R-126	3RC21BE225K	RESISTOR: Fixed; carbon; 2.2 megohms ±10%; ½ watt.	Relay coupling resistor	I.R.C.	WH-R-393
R-127	3RC21BE105K	RESISTOR: Fixed; carbon; 1 megohm ±10%; ½ watt; same as R-123.	Diode load resistor	I.R.C.	WH-R-387
R-128	3Z6005-128	RESISTOR: Fixed; wirewound; 50 ohms; 10 watt.	Filament bleeder	Sprague	WH-R-377
R-129	3RC21BE225K	RESISTOR: Fixed; carbon; 2.2 megohms ±10%; ½ watt; same as R-126.	Grid coupling resistor—relay tube	I.R.C.	WH-R-393
T-101	2S1508-2/1 2S1508-2/2	R-F TUNING UNIT: Consists of either (1) high frequency r-f transformer assembly; r-f transformer plug; shield can; Sickles #7343 condenser or (2) low frequency r-f transformer assembly; r-f transformer plug; shield can; Sickles #7343 condenser.	R-F transformer	Emerson	WH-T-138 or WH-T-140

Reference Symbol	*Army Stock No. Navy Stock No. British Ref. No.*	*NAME OF PART and DESCRIPTION*	*FUNCTION*	*MFR. and DESIG. or AWS TYPE*	*CONT. or GOVT. DWG. or SPEC. No.*
T-102	2S1508-2/4 2S1508-2/3	DETECTOR TUNING UNIT: Consists of either (1) high-frequency detector transformer assembly, detector transformer plug, Sickles #7343 condenser, WH-C-283, WH-C-284, SH-C-306 or (2) low frequency detector transformer assembly, detector transformer plug, Sickles #7343 condenser, SH-C-283, WH-C-286.	Superregenerative detector	Emerson	WH-T-130 or WH-T-135
V-101	2J6SG7	VACUUM TUBE: Type JAN-6SG7 (VT-211).	R-F amplifier	R.C.A.	
V-102	2J6J5	VACUUM TUBE: Type JAN-6J5 (VT-94).	Detector	R.C.A.	
V-103	2J6SL7GT	VACUUM TUBE: Type JAN-6SL7GT (VT-229).	Combined audio amplifier and quench oscillator	Sylvania	
V-104		VACUUM TUBE: Same as V-103.	Two tuned amplifier stages		
V-105		VACUUM TUBE: Same as V-103.	Diode rectifier		
V-106	2J6SN7GT	VACUUM TUBE: Type JAN-6SN7GT (VT-231).	Relay tube	Kenrad	
V-107	2Z5954	NEON TUBE: Gas-filled lamp.	Voltage regulator	G.E. T-2	WH-L-89
		TUBE HOLDER:	For neon tube, V-107	Littelfuse	WH-F-280
		SCREW DRIVER.	Aligning tool	American Radio Hardware	WH-F-280
	2Z8795.3	SOCKET: Standard 8-prong octal tube socket; 1½ inches between mounting holes which are 0.156" in diameter.	For vacuum tubes and two plug-in units	Cinch Meissner	WH-S-215

SECTION VIII

DRAWINGS

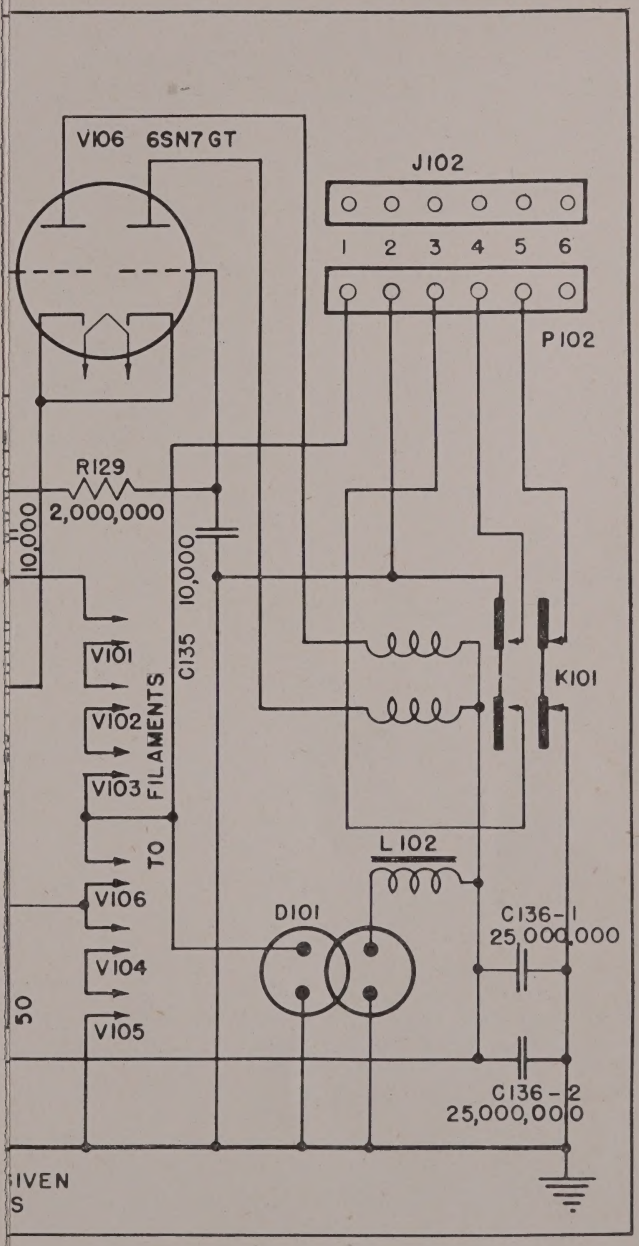


Figure 8-1. Radio Receiving Set AN/CRW-2 Schematic Diagram

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CO AN 08-30CRW2-2

CONFIDENTIAL
CO AN 08-30CRW2-2

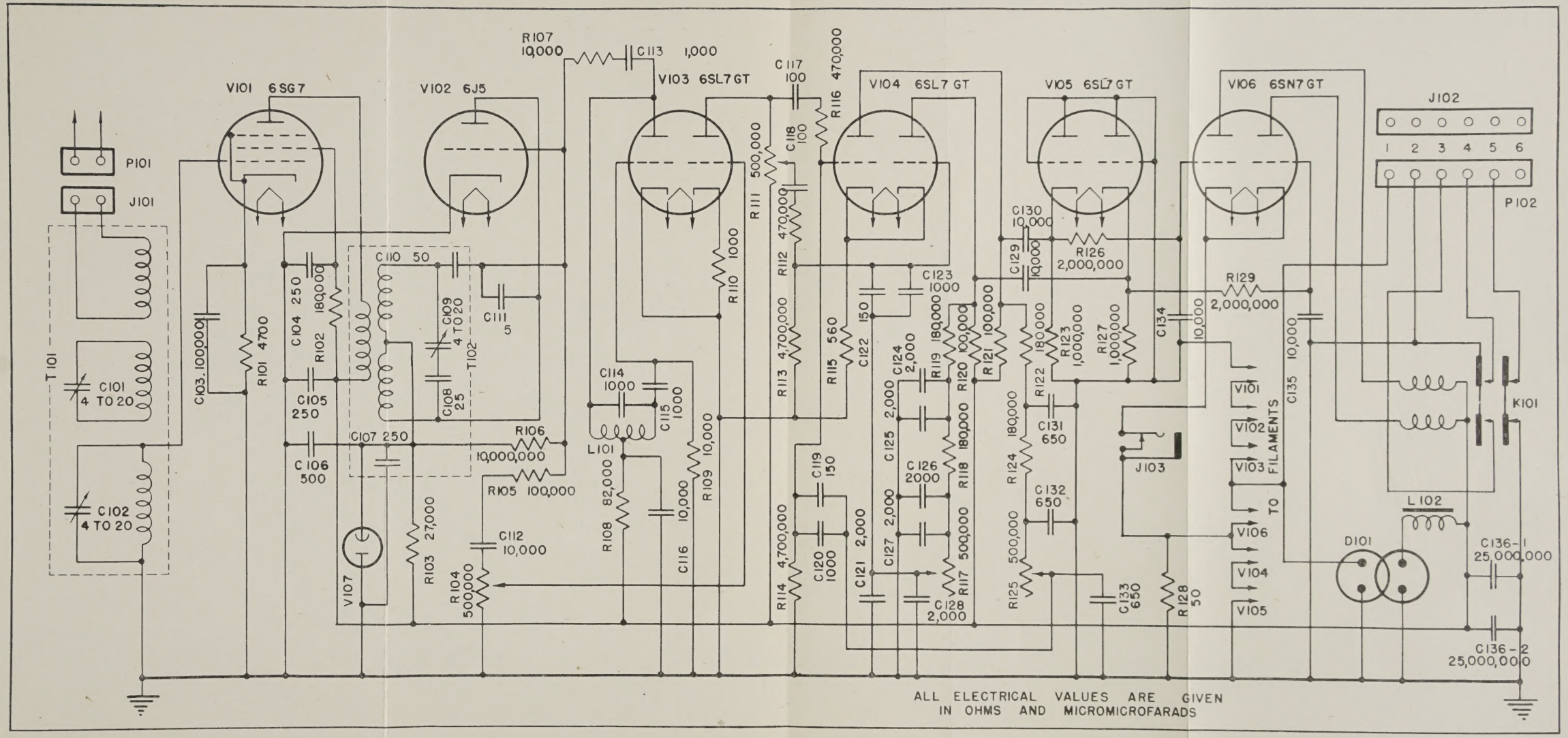

Figure 8-1. Radio Receiving Set AN/CRW-2 Schematic Diagram

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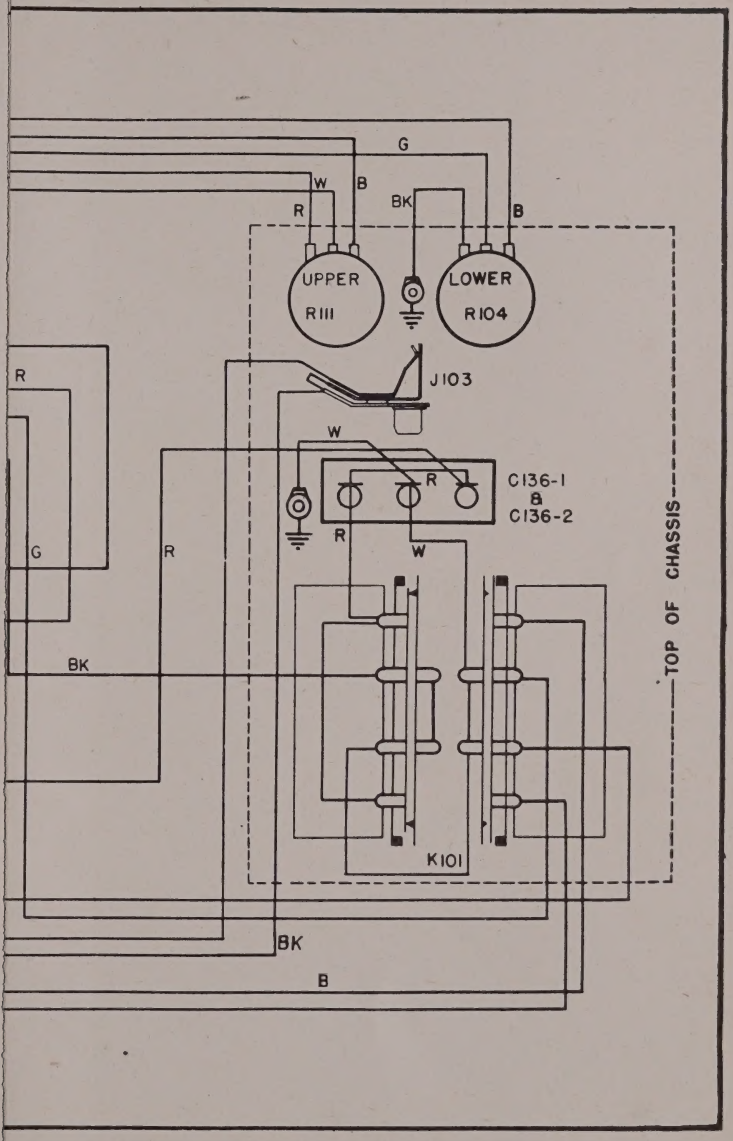

Figure 8-2. Radio Receiving Set AN/CRW-2 Wiring Diagram

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CO AN 08-30CRW2-2

CONFIDENTIAL
CO AN 08-30CRW2-2

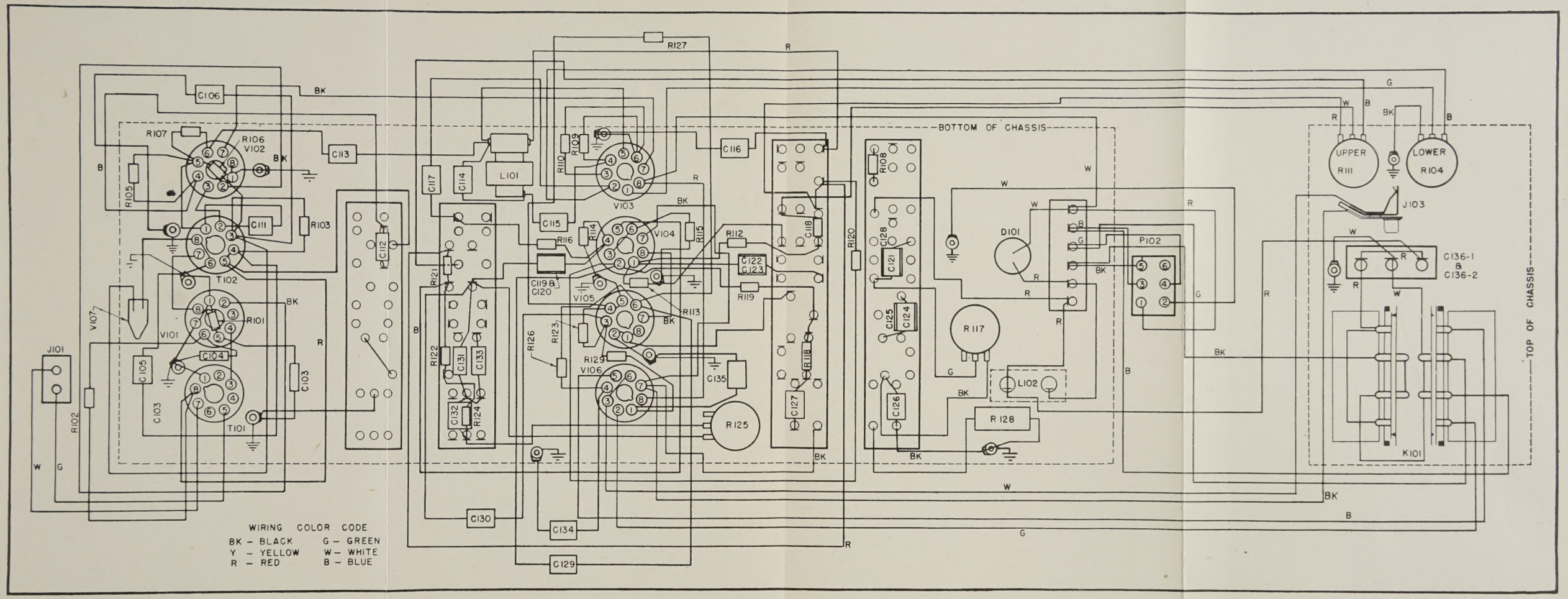

Figure 8-2. Radio Receiving Set AN/CRW-2 Wiring Diagram

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